

<b>Chemistry</b>	<b>Group-II</b>	<b>Paper-I</b>
<b>Time: 1.45 Hours</b>	<b>(Subjective Type)</b>	<b>Marks: 48</b>

**(Part-I)****Q.2. Write short answers to any Five (5) questions: 10****(i) Define Physical Chemistry.****Ans** Physical Chemistry is defined as:

"The branch of Chemistry that deals with the relationship between the composition and physical properties of matter along with changes in them."

**(ii) Write the chemical formula of water and sugar.****Ans** The chemical formula of water is  $H_2O$ .The chemical formula of sugar is  $C_{12}H_{22}O_{11}$ .**(iii) Define mixture with an example.****Ans** Mixture is formed by the simple mixing up of the substances. Example of mixture is Air (Mixture of different gases  $N_2$ ,  $CO_2$ ,  $O_2$ , etc.).**(iv) What is the nature of charge on Cathode rays?****Ans** Cathode rays have negative charge on an electron.**(v) How is U-235 used for power generation?****Ans** U-235 is used to generate electricity by carrying out controlled nuclear fission reactions in nuclear reactors.**(vi) Define electronegativity with an example.****Ans** The ability of an atom to attract the shared pair of electrons towards itself in a molecule, is called electro-negativity.**(vii) Define Shielding Effect.****Ans** The attraction of the nucleus on the electrons of outermost shell is reduced. As a result, an atom experiences less nuclear charge than that of the actual charge. It means that the electrons present in the filled energy levels screen or shield, the force of attraction of nucleus felt by the valence shell electrons. This is called as 'shielding effect'.



(viii) What is the trend of electron affinity in a group and period?

**Ans** Electron affinity values increase from left to right in the period. The reason for this increase is, as the size of atoms decreases in a period, the attraction of the nucleus for the incoming electron increases.

In a group of periodic table, electron affinity values decrease from top to bottom because the size of atoms increases down the group.

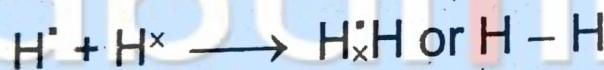
**Q.3. Write short answers to any FIVE (5) questions: 10**

(i) Differentiate between donor atom and acceptor atom.

<b>Donor</b>	<b>Acceptor</b>
The atom which provides the electron pair is termed as donor atom.	The other atom which accepts the electron pair is termed as acceptor.

(ii) Define a single covalent bond with an example.

**Ans** In this type of covalent bond, each bonded atom contributes one electron forming one bond pair e.g., in  $H_2$ ,  $Cl_2$ , etc.



(iii) What is meant by coordinate covalent compounds?

**Ans** Coordinate covalent or dative covalent bonding is a type of covalent bonding in which the bond pair of electrons is donated by one bonded atom only.

(iv) Define a melting point.

**Ans** The temperature at which the solid starts melting and coexists in dynamic equilibrium with liquid state is called melting point.

(v) Evaporation causes cooling. Why?

**Ans** Evaporation is a cooling process. When the high kinetic energy molecules vapourize, the temperature of the liquid decreases.



remaining molecules falls down. To compensate this deficiency of energy, the molecules of liquid absorb energy from the surroundings. As a result, the temperature of surroundings decreases and we feel cooling. For example, when we put a drop of alcohol on palm, the alcohol evaporates and we feel cooling effect.

(vi) Identify as colloids and suspension from the following: Paints, Jelly, milk and chalk in water.

**Ans**

Suspension	Colloids
Paints	Jelly
Chalk in water	Milk

(vii) Define an unsaturated solution.

**Ans** A solution which contains lesser amount of solute than that which is required to saturate it at a given temperature is called unsaturated solution.

(viii) Write name of two non-polar solvents.

**Ans** The two non-polar solvents are given below:

1. Ether
2. Carbon tetrachloride

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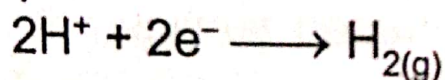
#### Q.4. Write short answers to any FIVE (5) questions: 10

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(i) Define reduction on the basis of electron and give example.

**Ans** Reduction is gain of electrons by an atom or ion.

Example is:



(ii) Define non-electrolytes and give examples.

**Ans** The substances, which do not ionize in solution and do not allow the current to pass through their solutions, are called non-electrolytes. For example, sugar solution and benzene are non-electrolytes.

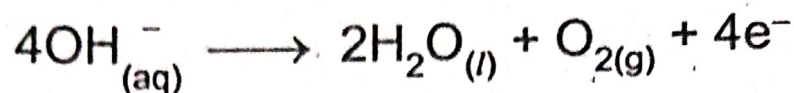
(iii) Where do the electron flow from Zn electrode in Daniel Cell?

**Ans** In Daniel cell, the electron flow from Zn electrode (anode) towards the cathode made up of copper.

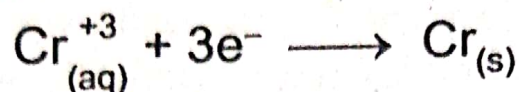


(iv) Write the redox reaction taking place during the electroplating of chromium.

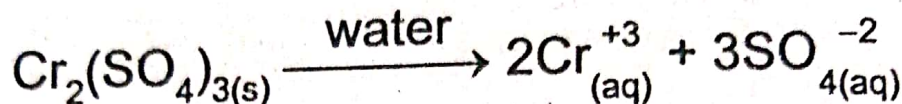
**Ans** At anode:



At cathode:



Overall reaction:



(v) Write down any two physical properties of metals.

**Ans** The important physical properties of metals are as following:

1. Almost all the metals are solids except mercury.
2. They have high melting and boiling points.

(vi) Write down the name of Noble metals.

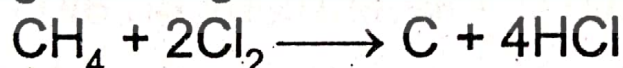
**Ans** The noble metals are copper, mercury, silver and gold.

(vii) Describe the non-metallic character in group and period of the periodic table.

**Ans** Non-metallic character decreases in a group downwards and increases in a period from left to right up to Halogens.

(viii) In bright sunlight, how  $\text{Cl}_2$  and  $\text{CH}_4$  react?

**Ans** In bright sunlight, the reaction is violent.



In the presence of diffused sunlight, the reaction of chlorine with methane is slow and gives series of compounds *i.e.*,  $\text{CH}_3\text{Cl}$ ,  $\text{CH}_2\text{Cl}_2$ ,  $\text{CHCl}_3$  and  $\text{CCl}_4$ .

(Part-II)

**NOTE:** Attempt any TWO (2) questions.

**Q.5.(a)** Write five differences between Rutherford's atomic theory and Bohr's atomic theory. (5)

**Ans** For Answer see Paper 2016 (Group-II), 5.(b).



(b) Describe four types of molecules with examples. (4)

**Ans** A molecule is formed by the chemical combinations of atoms. It is the smallest unit of a substance.

There are different types of molecules depending upon the number and types of atoms combining. A few types are discussed here:

#### **Monoatomic Molecule:**

A molecule consisting of only one atom is called monoatomic molecule. For example, the inert gases helium, neon and argon all exist independently in atomic form and they are called monoatomic molecules.

#### **Diatomic Molecule:**

If a molecule consists of two atoms, it is called diatomic molecule. For example: hydrogen ( $H_2$ ), oxygen ( $O_2$ ), chlorine ( $Cl_2$ ) and hydrogen chloride ( $HCl$ ).

#### **Triatomic Molecule:**

If molecule consists of three atoms, it is called triatomic molecule. For example,  $H_2O$  and  $CO_2$ .

#### **Polyatomic Molecule:**

If a molecule consists of many atoms, it is called polyatomic molecule. For example, methane ( $CH_4$ ), sulphuric acid ( $H_2SO_4$ ) and glucose ( $C_6H_{12}O_6$ ).

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**Q.6.(a) What is chemical bond? Why do atoms form chemical bond? (5)**

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#### **Ans** Chemical Bond:

A chemical bond is defined as "a force of attraction between atoms that holds them together in a molecule."

In other words, during bond formation, there is some force which holds the atoms together.

This attaining of 8 electron configuration in the outermost shell either by sharing, by losing or by gaining electrons, is called octet rule. This octet rule only symbolizes that noble gas electronic configuration should



be attained by atoms when they combine or react. For elements like hydrogen or helium; which have only a subshell, this becomes 'duplet rule'. It plays a significant role in understanding the formation of chemical bonds between atoms.

If the bond formation is between ions, it is due to an electrostatic force between them. But if bond formation is between similar atoms or between the atoms that have comparable electronegativities, then the chemical bond formation is by 'sharing' of electrons. This sharing of electrons may be mutual or one sided.

**(b) State Charles's Law. Derive its mathematical formula.** (4)

**Ans** French scientist J. Charles in 1787 presented his law that states

"The volume of a given mass of a gas is directly proportional to the absolute temperature if the pressure is kept constant."

When pressure  $P$  is constant, the volume  $V$  of a given mass of a gas is proportional to absolute temperature  $T$ .

Mathematically, it is represented as:

Volume  $\propto$  temperature represented as  $V \propto T$

or  $V = kT$  or  $\frac{V}{T} = k$

where  $k$  is proportionality constant. If temperature of the gas is increased, its volume also increases. When temperature is changed from  $T_1$  to  $T_2$ , the volume changes from  $V_1$  to  $V_2$ .

The mathematical form of Charles' Law will be:

$$\frac{V_1}{T_1} = k \quad \text{and} \quad \frac{V_2}{T_2} = k$$

As both equations have same value of constant therefore, their variables are also equal to each other



$$\therefore \frac{V_1}{T_1} = \frac{V_2}{T_2}$$

**Q.7.(a) What is oxidation state or oxidation number? Write its any four rules. (5)**

**Ans** Oxidation state or Oxidation Number:

Oxidation state or oxidation number (O.N.) is the apparent charge assigned to an atom of an element in a molecule or in an ion. For example, in HCl, oxidation number of H is +1 and that of Cl is -1.

**Rules for assigning oxidation numbers (O.N.):**

1. The oxidation number of all elements in the free state is zero.
2. The oxidation number of an ion consisting of a single element is the same as the charge on the ion.
3. The oxidation number of different elements in the periodic table is: in Group-1 it is +1, in Group-2 it is +2 and in Group-3 it is +3.
4. The oxidation number of hydrogen in all its compounds is +1. But in metal hydrides it is -1.

**(b) Write any four characteristics of suspension. (4)**

**Ans** Characteristics of Suspension:

1. The particles are of largest size. They are larger than  $10^{-5}$  cm in diameter.
2. Particles remain undissolved and form a heterogeneous mixture. Particles settle down after sometime.
3. Particles are big enough to be seen with naked eye.
4. Solute particles cannot pass through filter paper.